PATENT ABSTRACTS OF JAPAN

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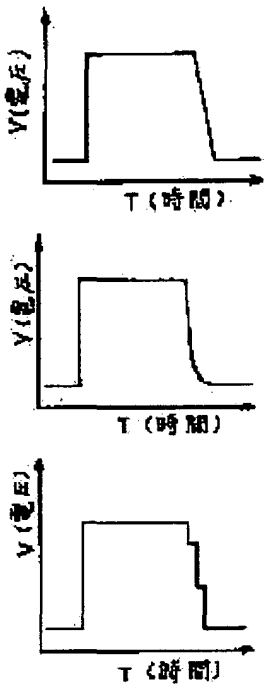
(54) DRIVING METHOD FOR LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PURPOSE: To obtain a fine image with high resolution by the active matrix display device by lowering the level of a flicker which causes the display quality to decrease while the irregularity of the flicker on a screen due to an increase in the capacity of gate lines for high density is a technical problem.

CONSTITUTION: The rising waveform of a scanning line waveform is, for example, a ramp waveform, exponential function waveform, or staircase waveform. Thus, high frequency components are made small to reduce the potential drop of a pixel potential waveform outputted by a high-pass filter consisting of a transistor, a parasitic capacitance between scanning lines, and a resistance used by regarding the transistor as a variable resistance. Consequently, the flicker can be suppressed low and the image of high quality is obtained.



LEGAL STATUS

[Date of request for examination] 28.12.1998

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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The data line and the scanning line are arranged in the shape of a matrix, and it has at least one or more switching transistors near [the] the intersection section. In the liquid crystal display which has the active matrix substrate by which the gate of this transistor connected with the scanning line, the source of a **** transistor was connected to the data line, and the drain of this transistor was further connected to the transparent pixel electrode The drive method of the liquid crystal display characterized by the falling wave of the pulse in the voltage waveform of a scanning signal being a lamp wave.
[Claim 2] The drive method of the liquid crystal display characterized by the falling wave of the pulse in the voltage waveform of a scanning signal being an exponential-function wave in a liquid crystal display according to claim 1.
[Claim 3] The drive method of the liquid crystal display characterized by the falling wave of the pulse in the voltage waveform of a scanning signal being a stair-like wave in a liquid crystal display according to claim 1.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] It is related with a liquid crystal display.
[0002]
[Description of the Prior Art] The signal of the scanning line in the conventional active matrix liquid crystal display object was carrying out the square wave shown in drawing 6 . The gate of the transistor of each pixel which is in the scanning line in inputting the scanning signal which delayed the scanning line by pulse width one by one was made to turn on, and operation which writes a video signal in each pixel from a signal line was carried out. the case of TV signal of an NTSC color TV system -- the pulse width of 63.5microsec for a horizontal scanning period -- a scanning signal -- each gate line -- giving -- the period -- the gate of the transistor which passes to the scanning line all the time is in the turned-on state
[0003]
[Problem(s) to be Solved by the Invention] It falls by the conventional scanning-line signal, and since a wave is also in the state of a square wave, a high frequency component is a high signal. The outlet of the high-pass filter circuit which consists of resistance at the time of considering that the parasitic capacitance 6 and transistor 3 which consist of a drain of a transistor 3 and the gate are variable resistance in the pixel equal circuit shown in drawing 4 on the other hand is pixel potential. That is, the signal of the scanning line leads to pixel potential through a parasitic capacitance 6, without ******(ing) with the high frequency component. For this reason, big fall of potential deltaV (deltaV of drawing 5) arises, and it has become the cause of a flicker. Moreover, using an active matrix substrate, although densification is possible, since the capacity of a gate line is large, by high-density specification, the phenomenon in which the level of a flicker differs in a field arises especially for the fall of potential of this pixel potential.
[0004] Even if this doubles common electrode potential with the position which serves as the minimum of a flicker in a certain position in a screen, the phenomenon in which a flicker arises arises and it will be in the state where proper common electrode potential does not exist in another position. It had become the big technical-problem point of densification technology.
[0005]
[Means for Solving the Problem] The data line and the scanning line are arranged in the shape of a matrix, and it has at least one or more switching transistors near [the] the intersection section. In the liquid crystal display which has the active matrix substrate by which the gate of this transistor connected with the scanning line, the source of a **** transistor was connected to the data line, and the drain of this transistor was further connected to the **** pixel electrode It is characterized by the falling wave of the scanning signal in the drive method of the scanning signal being a lamp wave, an exponential-function wave, or a stair-like wave.
[0006]
[Function] The liquid crystal display object which has an active matrix substrate in a liquid crystal display object can increase the number of pixels, and can arrange a pixel with high density to the same screen size. this -- a texture -- the clear screen of fine high resolution is realizable the capacity which acts to a gate line as a ** student as a technical problem of densification technology carried out like this increases, and the phenomenon in which proper common electrode potentials differ especially by right and left of a screen in a screen arises This means that the distribution of a flicker occurs because the variation in a dc component arises in a field. CHIRATSUKI very much seldom looks at many such pictures.
[0007] It is mentioned to what is considered as a cause of this flicker that the fall of potentials by the gate line in the maintenance state of a pixel differ by right and left of a screen. Although drawing 4 is the 1-pixel equivalent view of an active matrix substrate, fall of potential deltaV in the pixel potential wave shown in drawing 5 by the drain section of a

transistor and the parasitic capacitance 6 between gate lines has produced it.
[0008] In order to prevent the field interior division cloth of the above-mentioned flicker, it is possible to make small the effect of this fall of potential deltaV. Fall of potential deltaV is a value decided by the ratio of the voltage of a gate line, i.e., a scanning signal and voltage, the pixel capacity in drawing 4 , and a parasitic capacitance. Since pixel capacity and a parasitic capacitance are decided by the specification and structure of an active matrix substrate, a big effect is not expectable. Although the value of fall of potential deltaV will be made small with the voltage of a scanning signal if it carries out, since pressing down low voltage with the high-level voltage of a scanning signal will lower the write-in capacity to a pixel, naturally restrictions arise. If the transistor 3 in drawing 4 is considered to be a kind of variable resistance here, pixel potential will be considered to be the outlet of a high-pass filter where the input minded the parasitic capacitance 6 and the transistor (variable resistance) 3 by the scanning signal of the gate line 1. That is, the high frequency component of a scanning signal serves as a circuit which it lets pass without a voltage drop.

[0009] How to lose the high frequency component of the falling wave of a scanning signal to make small fall of potential deltaV by the parasitic capacitance 6 can be considered. It is specifically making a falling wave into the shape of a lamp, and an exponential-function wave, and making it loose falling. Moreover, the same effect is expectable also by falling to others and making a wave into a stair-like wave. By making it the wave of these configurations, fall of potential deltaV by the scanning signal can be small pressed down compared with usual according to the effect of a high-pass filter circuit. As a result, it becomes possible to make it small at the grade in which the distribution within a field is not conspicuous by pressing down the level of a flicker, either.
[0010]
[Example] The scanning signal potential wave in this invention is shown in drawing 1 , drawing 2 , and drawing 3 . Drawing 2 is an exponential-function falling wave, and it can realize by adding resistance 8 and capacity 7 to the business shown in drawing 7 at the scanning-line input section. When a liquid crystal display uses an external driver integrated circuit, it is possible, even if it puts the above-mentioned resistance and capacity into the last stage of a driver IC, and it can realize and it puts resistance and capacity into the scanning-line input section on an active matrix substrate. The value of such resistance and capacity is optimized and it is made to bring down with the time constant within the horizontal-retrace-line section. However, since it starts with the time constant same as a standup, it is needed, using as a premise capacity which can do the writing to pixel capacity and the data line sufficiently quickly. It becomes possible to lose the high frequency component of a scanning-line wave, and to ease the fall of potential of a pixel potential wave by making the falling wave of the scanning line into an exponential-function wave within limits which do not have the influence of the time constant of a standup.
[0011] There is the method of putting in the inverter as a buffer and optimizing the transistor size, as shown in drawing 8 as other methods of furthermore realizing an exponential-function wave. By the active matrix substrate in which the driver line was built, the same effect is acquired by optimizing the size and the current characteristic of an inverter of the last stage buffer circuit.
[0012] Moreover, as a material of the above-mentioned resistance, contest polysilicon with which the gate electrode material was doped can be considered with the polysilicon contest TFT, and it is N+ at an amorphous silicon TFT. It is possible to use an amorphous silicon etc.
[0013] It is the lamp wave in the falling wave of the scanning signal of this invention which is shown in drawing 1 , and it becomes realizable by putting in the circuit using the operational amplifier shown in drawing 9 before the input of the scanning line. By making it a lamp wave, the amount of the charge which escapes [as the variable resistance in the high-pass filter of drawing 4] through a transistor 3 the bottom wholly increases compared with a square wave, and an amplitude becomes small. That is, the amount of the fall of potential of a pixel becomes small, and a flicker will also be pressed down.
[0014] Moreover, if the time of lamp wave falling needs to be in the horizontal-retrace-line section and is the video signal of an NTSC color TV system, it will be called less than 10.9micro second.
[0015] It is the stair-like wave in the falling wave of the scanning signal of this invention which is furthermore shown in drawing 3 . It is the circuit of this example, and the block diagram shown in drawing 10 forms an analog switch 12 behind the above-mentioned falling lamp wave generating circuit, and inputs a staircase generating timing pulse as the gate pulse. Those waves are shown in drawing 11 . 13 is a gate falling lamp wave voltage waveform, and 14 is the voltage waveform of the timing pulse for staircase generating. The scanning signal wave type which is the output of the analog switch 12 at this time is shown in drawing 12 . 15 becomes possible [bringing close to the wave shown in drawing 3 by optimizing the duty ratio of a timing pulse 14 by the steer step waveform of this invention]. There is the method of using the sample hold circuit shown in the block circuit diagram of drawing 13 as other methods, and creating a staircase. If a sampling switch S is closed, Capacitor C will be charged on voltage equal to an output lamp

wave-amplitude value from a lamp wave circuit, and if a sampling switch S is opened next, the charge voltage of a capacitor will be held and outputted. It becomes possible to optimize the timing of the sampling time of a sampling switch S, and to generate a predetermined staircase.

[0016]

[Effect of the Invention] The high frequency component of a scanning signal can be made small by making it the falling wave of the lamp wave which shows a scanning signal to drawing 1 in the drive method of the liquid crystal display of this invention, the exponential-function wave shown in drawing 2 , or the staircase shown in drawing 3 . Since the high-pass filter outlet shown in drawing 4 is pixel potential, pixel fall of potential by the scanning-line wave can be made small, and it becomes possible to press down a flicker low. it is possible to avoid the nonuniformity in a flicker screen in the densification of a pixel in an active liquid crystal display furthermore -- becoming -- a texture -- it becomes possible to realize the picture of fine high resolution

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[Translation done.]

* NOTICES *

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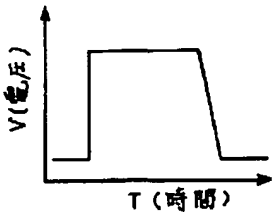
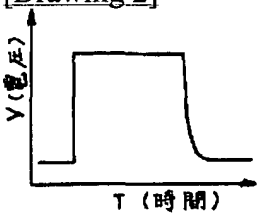
DRAWINGS

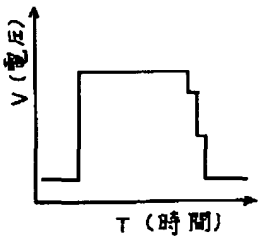
[Drawing 1]



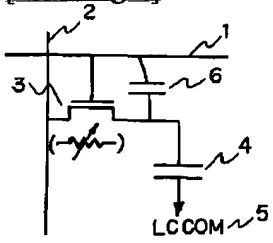
[Drawing 2]



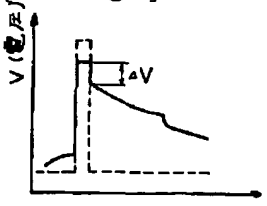
[Drawing 3]



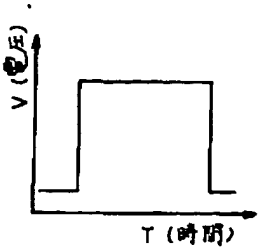
[Drawing 4]



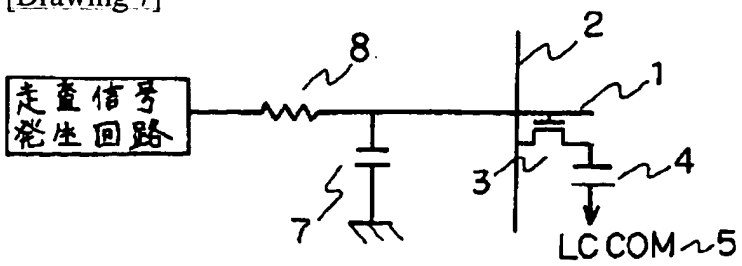
[Drawing 5]



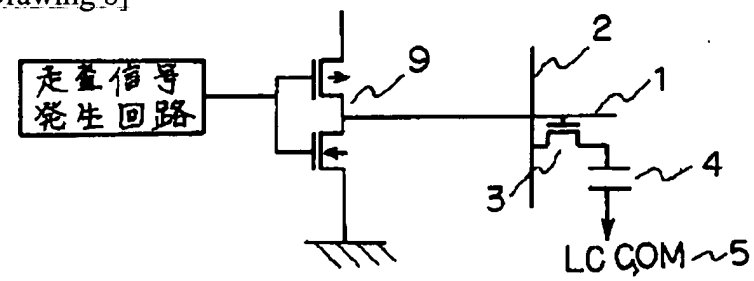
[Drawing 6]



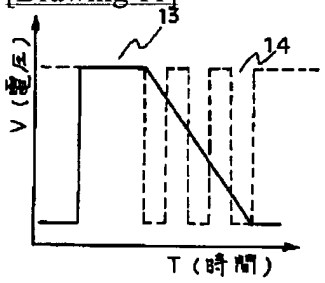
[Drawing 7]



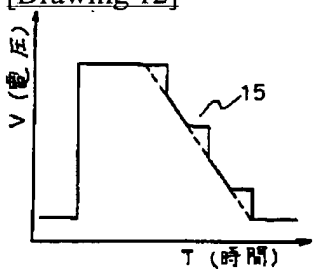
[Drawing 8]



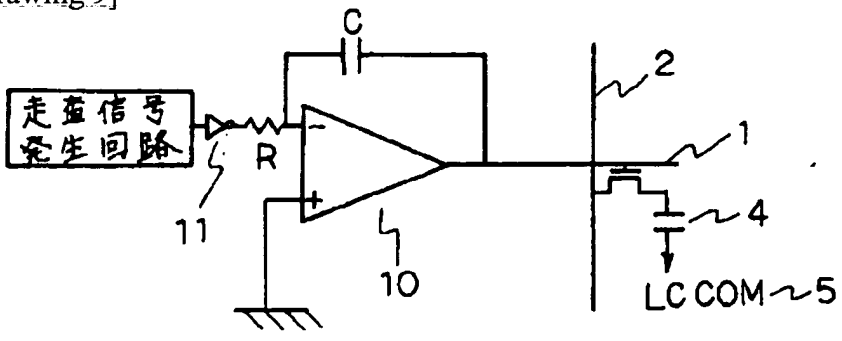
[Drawing 11]



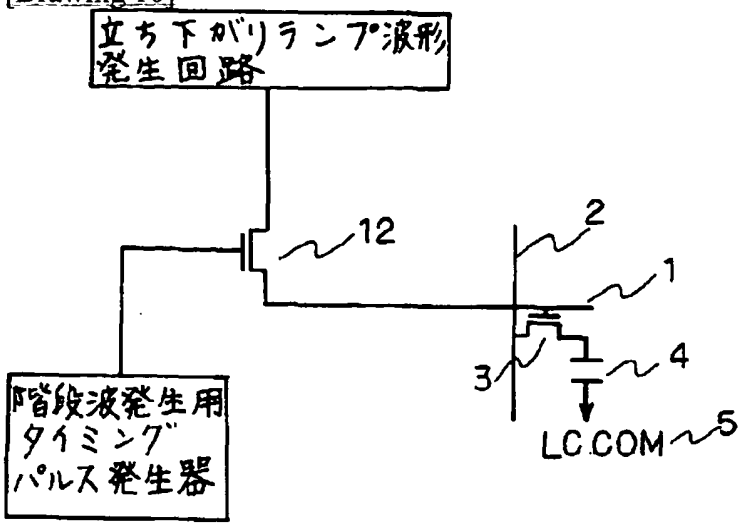
[Drawing 12]



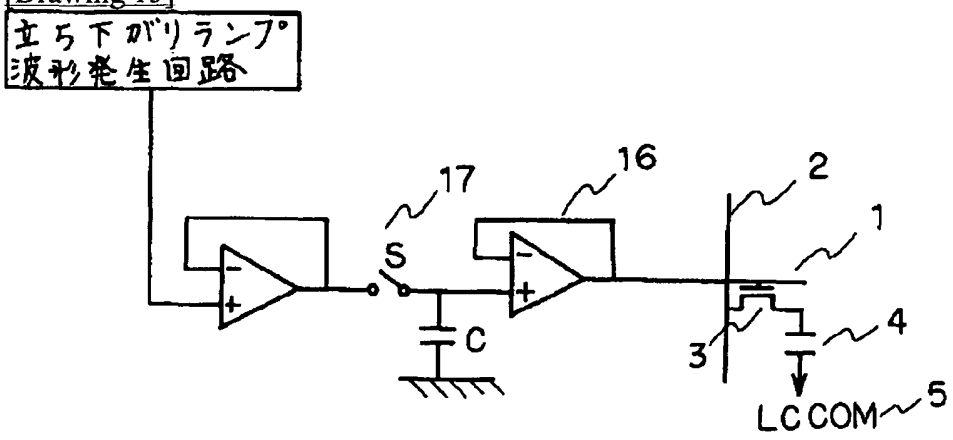
[Drawing 9]



[Drawing 10]



[Drawing 13]



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* NOTICES *

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law.
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[Date of issue] November 5, Heisei 11 (1999).

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[FI]

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G09G 3/36 .

[Procedure revision]
[Filing Date] December 28, Heisei 10.
[Procedure amendment 1]
[Document to be Amended] Specification.
[Item(s) to be Amended] Claim.
[Method of Amendment] Change.
[Proposed Amendment]
[Claim(s)]
[Claim 1] It is the drive method of liquid crystal equipment of having the transistor connected to the data line and the scanning line which have been arranged in the shape of a matrix, and the aforementioned data line and the scanning line, and the pixel electrode connected to the aforementioned transistor.
The drive method of the liquid crystal display characterized by falling of the pulse in the voltage waveform of the scanning signal supplied to the aforementioned scanning line serving as a lamp wave.
[Claim 2] It is the drive method of liquid crystal equipment of having the transistor connected to the data line and the scanning line which have been arranged in the shape of a matrix, and the aforementioned data line and the scanning line, and the pixel electrode connected to the aforementioned transistor.
The drive method of the liquid crystal display characterized by falling of the pulse in the voltage waveform of the scanning signal supplied to the aforementioned scanning line serving as an exponential-function wave.
[Claim 3] It is the drive method of liquid crystal equipment of having the transistor connected to the data line and the scanning line which have been arranged in the shape of a matrix, and the aforementioned data line and the scanning line, and the pixel electrode connected to the aforementioned transistor.
The drive method of the liquid crystal display characterized by falling of the pulse in the voltage waveform of the scanning signal supplied to the aforementioned scanning line serving as a stair-like wave.
[Procedure amendment 2]

[Document to be Amended] Specification.
[Item(s) to be Amended] 0005.
[Method of Amendment] Change.
[Proposed Amendment]
[0005]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention is the drive method of liquid crystal equipment of having the transistor connected to the data line and the scanning line which have been arranged in the shape of a matrix, and the aforementioned data line and the scanning line, and the pixel electrode connected to the aforementioned transistor, and falling of the pulse in the voltage waveform of the scanning signal supplied to the aforementioned scanning line is characterized by being a lamp wave. this invention is the drive method of liquid crystal equipment of having the transistor connected to the data line and the scanning line which have been arranged in the shape of a matrix, and the aforementioned data line and the scanning line, and the pixel electrode connected to the aforementioned transistor, and is characterized by falling of the pulse in the voltage waveform of the scanning signal supplied to the aforementioned scanning line serving as an exponential-function wave. this invention is the drive method of liquid crystal equipment of having the transistor connected to the data line and the scanning line which have been arranged in the shape of a matrix, and the aforementioned data line and the scanning line, and the pixel electrode connected to the aforementioned transistor, and is characterized by falling of the pulse in the voltage waveform of the scanning signal supplied to the aforementioned scanning line serving as a stair-like wave.
[Procedure amendment 3]
[Document to be Amended] Specification.
[Item(s) to be Amended] 0006.
[Method of Amendment] Change.
[Proposed Amendment]
[0006]
[Function] The liquid crystal display object which has an active matrix substrate in a liquid crystal display object can increase the number of pixels, and can arrange a pixel with high density to the same screen size. The capacity which is parasitic on a gate line as a technical problem of such densification technology increases, and the phenomenon in which proper common electrode potentials differ especially by right and left of a screen arises in a screen. This means that the distribution of a flicker occurs because the variation in a dc component arises in a field. CHIRATSUKI very much seldom looks at many such pictures.

[Translation done.]

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(43)公開日　平成６年(1994)４月22日

(51)Int.Cl.[5]		識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｇ０２Ｆ	1/133	５５０	9226－2K		
	1/136	５００	9018－2K		
Ｇ０９Ｇ	3/36		7319－5G		

審査請求　未請求　請求項の数３(全　５　頁)

(21)出願番号　特願平4－258403

(22)出願日　平成４年(1992)９月28日

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(54)【発明の名称】　液晶表示装置の駆動方法

(57)【要約】

【目的】　アクティブマトリックス液晶表示装置において、フリッカーは表示品質を落とす原因となる。又高密度化においてゲートラインの容量増加に供なうフリッカーの画面内のむらは技術的課題として挙げられる。この様なフリッカーのレベルを下げ、高解像でキメ細かい画像を実現することを目的とする。

【構成】　走査線波形の立ち下がり波形をランプ状波形又は指数関数波形又は階段状波形とする。

【効果】　この様にして高周波成分を小さくすることで、トランジスタと走査線間の寄生容量とトランジスタを可変抵抗と見なした抵抗で構成されるハイパスフィルター出力の画素電位波形における電位降下を小さくすることが可能となる。これによりフリッカーを低く押えることが可能となり、高品位の画像が実現できる。

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【特許請求の範囲】

【請求項1】　マトリックス状にデータ線と走査線が配置され、その交点部近くに少なくとも1つ以上のスイッチングトランジスタを有し、該トランジスタのゲートが走査線に接続し、又該トランジスタのソースがデータ線に接続され、さらに該トランジスタのドレインが透明画素電極に接続されたアクティブマトリックス基板を有する液晶表示装置において、走査信号の電圧波形におけるパルスの立ち下がり波形がランプ波形となっていることを特徴とする液晶表示装置の駆動方法。

【請求項2】　請求項1記載の液晶表示装置において走査信号の電圧波形におけるパルスの立ち下がり波形が指数関数波形となっていることを特徴とする液晶表示装置の駆動方法。

【請求項3】　請求項1記載の液晶表示装置において走査信号の電圧波形におけるパルスの立ち下がり波形が階段状波形となっていることを特徴とする液晶表示装置の駆動方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】液晶表示装置に関するものである。

【0002】

【従来の技術】従来のアクティブマトリックス液晶表示体における走査線の信号は図6に示す矩形波をしていた。走査線に順次パルス幅分遅延させた走査信号を入力することで走査線にある各画素のトランジスタのゲートをオンさせ、各画素へ信号線より映像信号を書き込む動作をしていた。ＮＴＳＣ方式のＴＶ信号の場合では水平走査期間分の６３．５μｓｅｃのパルス幅で走査信号を各ゲートラインに与え、その期間ずっと走査線に通ずるトランジスタのゲートはオンした状態である。

【0003】

【発明が解決しようとする課題】従来の走査線信号では立ち下がり波形も矩形波の状態であるから、高周波成分が高い信号である。一方図4に示す画素等価回路においてトランジスタ3のドレインとゲートで構成される寄生容量6とトランジスタ3を可変抵抗と見なした場合の抵抗で構成されるハイパスフィルター回路の出口が画素電位である。つまり走査線の信号は高周波成分を持ったため減衰することなく、寄生容量6を介して画素電位に通じる。このため大きな電位降下ΔＶ（図5のΔＶ）が生じ、フリッカーの原因となっている。又アクティブマトリックス基板を用いて高密度化が可能ではあるが、この画素電位の電位降下のため特に高密度の仕様ではゲートラインの容量が大きいため面内においてフリッカーのレベルが異なる現象が生じる。

【0004】これは共通電極電位を画面内のある位置においてフリッカーの最小となる位置に合わせても、別の位置ではフリッカーが生じるという現象が生じ、適正な

2

共通電極電位が存在しない状態になる。高密度化技術の大きな課題点となっていた。

【0005】

【課題を解決するための手段】マトリックス状にデータ線と走査線が配置され、その交点部近くに少なくとも1つ以上のスイッチングトランジスタを有し、該トランジスタのゲートが走査線に接続し又該トランジスタのソースがデータ線に接続され、さらに該トランジスタのドレインが透面画素電極に接続されたアクティブマトリックス基板を有する液晶表示装置において、その走査信号の駆動方法での走査信号の立ち下がり波形がランプ波形又は指数関数波形又は階段状波形であることを特徴とする。

【0006】

【作用】液晶表示体の中でアクティブマトリックス基板を有する液晶表示体は画素数を増やして、同一画面サイズに高密度に画素を配置させることができる。これによってキメ細かな高解像度の鮮明な画面を実現できる。こうした高密度化技術の課題としてゲートラインに帰生する容量が増加し、画面内特に画面の左右で適正な共通電極電位が異なる現象が生じる。これは面内で直流成分のバラツキが生じることでフリッカーの分布が発生することを意味する。こうした画像はチラツキが多く大変見づらいものである。

【0007】このフリッカーの原因として考えられるものに画素の保持状態におけるゲートラインによる電位降下が画面の左右で異なる事が挙げられる。図4はアクティブマトリックス基板の1画素の等価図であるがトランジスタのドレイン部とゲートライン間の寄生容量6によって、図5に示す画素電位波形中の電位降下ΔＶが生じている。

【0008】前述のフリッカーの面内分布を防止するためにはこの電位降下ΔＶの効果を小さくすることが考えられる。電位降下ΔＶはゲートラインの電圧、つまり走査信号と電圧と図4における画素容量と寄生容量の比によって決まる値である。画素容量と寄生容量はアクティブマトリックス基板の仕様と構造で決ってくるので大きな効果は期待できない。とすると走査信号の電圧によって電位降下ΔＶの値を小さくするわけであるが、走査信号の電圧のハイレベルの電圧を低く押えることは画素への書き込み能力を下げることになるので当然制約が生じる。ここで図4におけるトランジスタ3を一種の可変抵抗と考えると画素電位は入力がゲートライン1の走査信号で寄生容量6とトランジスタ（可変抵抗）3を介したハイパスフィルターの出口と考えられる。つまり走査信号の高周波成分は電圧降下なく通す回路となっている。

【0009】寄生容量6による電位降下ΔＶを小さくするには走査信号の立ち下がり波形の高周波成分を無くする方法が考えられる。具体的には立ち下がり波形をランプ状又は指数関数波形にして緩やかな立ち下がりにする

ことである。又他には立ち下がり波形を階段状波形にすることでも同様の効果が期待できる。これらの形状の波形にすることによって、走査信号による電位降下ΔＶはハイパスフィルター回路の効果によって通常に比べ小さく押えることができる。ひいてはフリッカーのレベルを押えることで面内の分布もめだたない程度に小さくすることが可能となる。

【００１０】

【実施例】本発明における走査信号電位波形を図１、図２、図３に示す。図２は指数関数立ち下がり波形で、図７に示す用に走査線入力部に抵抗８と容量７を付加することで実現できる。液晶表示装置が外付けドライバー集積回路を用いる場合は、ドライバーＩＣの最終段に前述の抵抗と容量を入れて実現できるし、又アクティブマトリックス基板上で走査線入力部に抵抗と容量を入れても可能である。これらの抵抗と容量の値を最適化して水平帰線区間以内の時定数で立ち下げる様にする。但し立ち上がりも同じ時定数で立ち上がるので、画素容量とデータ線への書き込みは充分速くできる能力は前提として必要になる。立ち上がりの時定数の影響がない範囲内で走査線の立ち下がり波形を指数関数波形にすることで、走査線波形の高周波成分を無くし画素電位波形の電位降下を緩和することが可能となる。

【００１１】さらに指数関数波形を実現する他の方法として図８に示す様にバッファーとしてのインバーターを入れてそのトランジスタサイズを最適化する方法がある。ドライバー回路が内蔵されたアクティブマトリックス基板では最終段バッファー回路のインバーターのサイズ及び電流特性を最適化することで同様の効果が得られる。

【００１２】又前述の抵抗の材料としてはポリシリコンＴＦＴでは、ゲート電極材料のドープされたポリシリコンが考えられ、アモルファスシリコンＴＦＴではN^+ アモルファスシリコン等を利用することが考えられる。

【００１３】図１に示すのが本発明の走査信号の立ち下がり波形の中のランプ波形で、図９に示すオペアンプを利用した回路を走査線の入力前に入れることで実現が可能となる。ランプ波にすることによって図４のハイパスフイルターにおける可変抵抗とみなしたトランジスタ３を通って逃げる電荷の量が、矩形波に比べ多くなり、振幅が小さくなる。つまり画素の電位降下の量は小さくなり、フリッカーも押えられることになる。

【００１４】又ランプ波立ち下がりの時間は水平帰線区間内である必要があり、ＮＴＳＣ方式のビデオ信号であれば１０．９μ秒以内ということになる。

【００１５】さらに図３に示すのが本発明の走査信号の立ち下がり波形の中の階段状波形である。図１０に示すブロック図がこの実施例の回路であり、前述の立ち下がりランプ波形発生回路の後にアナログスイッチ１２を設け、そのゲートパルスとして階段波発生タイミングパルスを入力する。図１１にそれらの波形を示す。１３がゲート立ち下がりランプ波電圧波形で、１４が階段波発生用タイミングパルスの電圧波形である。この時のアナログスイッチ１２の出力である走査信号波形を図１２に示す。１５が本発明の階段波形で、タイミングパルス１４のデューティー比を最適化することで図３に示す波形に近付けることが可能となる。他の方法としては図１３のブロック回路図に示すサンプルホールド回路を利用し階段波を作成する方法がある。サンプリングスイッチＳを閉じるとランプ波形回路からの出力ランプ波形の振幅値に等しい電圧でコンデンサＣに充電し、次にサンプリングスイッチＳを開くとコンデンサの充電電圧が保持され出力される。サンプリングスイッチＳのサンプリング時間のタイミングを最適化し所定の階段波を発生させることが可能となる。

【００１６】

【発明の効果】本発明の液晶表示装置の駆動方法において走査信号を図１に示すランプ波、又は図２に示す指数関数波、又は図３に示す階段波の立ち下がり波形にすることによって、走査信号の高周波成分を小さくすることができる。図４に示すハイパスフィルター出口が画素電位であることから、走査線波形による画素電位降下を小さくすることができ、フリッカーを低く押えることが可能となる。さらにアクティブ液晶表示装置においては画素の高密度化におけるフリッカー画面内ムラを回避することが可能となり、キメ細かな高解像度の画像を実現することが可能となる。

【図面の簡単な説明】

【図１】　本発明の走査信号ランプ波立ち下がり波形図。

【図２】　本発明の走査信号指数関数波立ち下がり波形図。

【図３】　本発明の走査信号階段波立ち下がり波形図。

【図４】　本発明の１画素等価回路路図。

【図５】　従来の技術の画素電位波形図。

【図６】　従来の技術の走査信号電位波形図。

【図７】　本発明の走査信号指数関数波立ち下がり波発生回路ブロック図。

【図８】　本発明の走査信号指数関数波立ち下がり波発生回路ブロック図。

【図９】　本発明の走査信号ランプ波立ち下がり波形発生回路ブロック図。

【図１０】　本発明の走査信号階段波立ち下がり波形発生回路ブロック図。

【図１１】　本発明の走査信号階段波立ち下がり波形発生回路ブロックの電圧波形図。

【図１２】　本発明の走査信号階段波立ち下がり波形図。

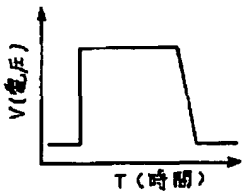
【図１３】　本発明の走査信号階段波発生回路ブロック図。

5　　6

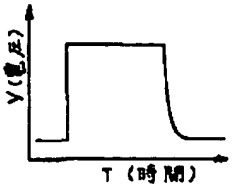
【符号の説明】

1　走査線
2　データ線
3　トランジスタ
4　画素容量
5　共通電極電位
6　トランジスタと走査線間の寄生容量
7　指数関数立ち下がり波発生容量
8　指数関数立ち下がり波発生抵抗
9　指数関数立ち下がり波発生インバーター
10　オペアンプ
11　インバーター
12　アナログスイッチ
13　ランプ立ち下がり波形
14　階段波発生用タイミングパルス
15　階段状立ち下がり走査信号波形
16　サンプルホールド回路中のオペアンプ
17　サンプリングスイッチ

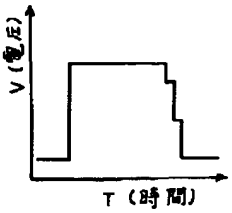
【図1】



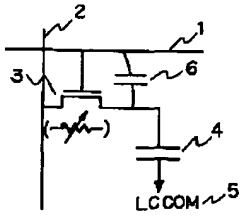
【図2】



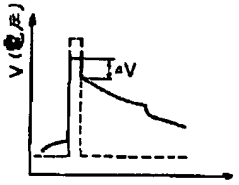
【図3】



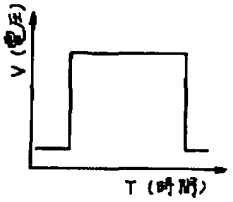
【図4】



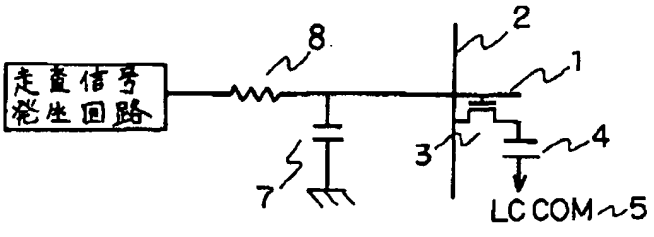
【図5】



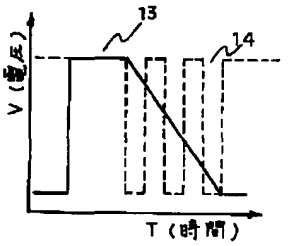
【図6】



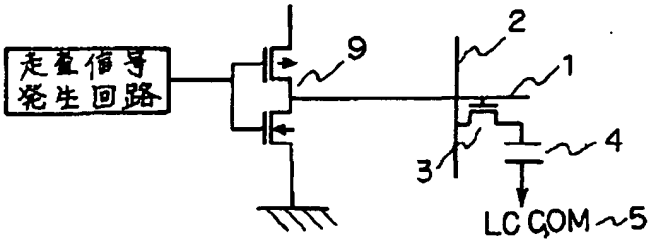
【図7】



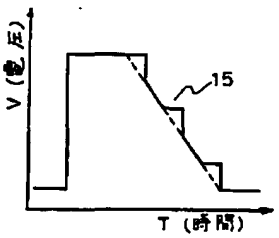
【図11】



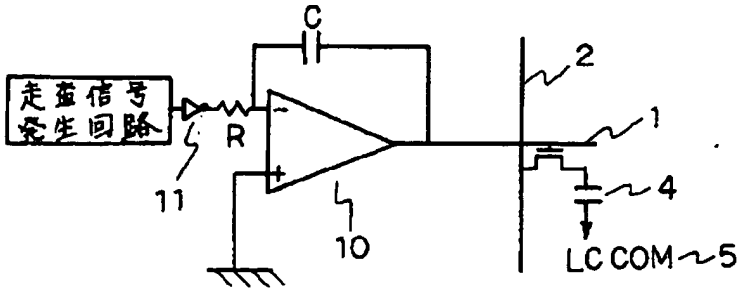
【図8】



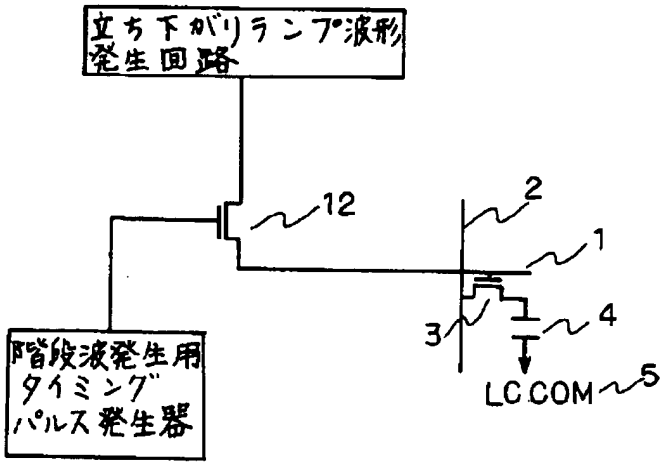
【図12】



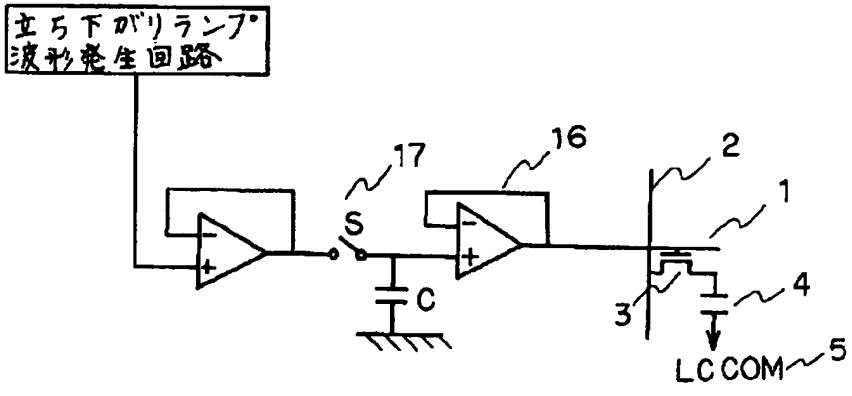
【図9】


C
走査信号
発生回路
R
11
10
2
1
4
LC COM
5

【図10】


立ち下がりランプ波形
発生回路
12
2
1
3
4
LC COM
5
階段波発生用
タイミング
パルス発生器

【図13】


立ち下がりランプ
波形発生回路
17
16
S
C
2
1
3
4
LC COM
5